REMARKS

Applicant hereby replies to the Final Action of June 20, 2005, in the above-referenced patent application. Prior to this reply, Claims 1-4 and 6-11 were pending in the application. Through this reply, new Claims 13 and 14 have been added. As such, claims 1-4, 6-11, 13 and 14 are pending in the application.

Claims 1 and 6-9 were rejected, and Claims 2-4 and 10-11 were objected to as depending on rejected base claims, but were deemed allowable if rewritten in independent form including the limitations of base claims and any intervening claims.

Rejection of claims over Scognamiglio were withdrawn by the Examiner.

Applicant wishes to thank the Examiner for detailing the allowable claims.

Claim rejections under 35 U.S.C. 102(b)

Rejection of Claims 1, 6-8 under 35 USC 102(b) as being anticipated by USPN 5,038,388 to Song is respectfully traversed because Song does not disclose all of the claimed limitations.

Image detail enhancement emphasizes the high frequency components that are embedded in the image so that visual appearance of the image can be sharpened or can appear more vivid to a human being. Song is directed to a method and apparatus for sharpening edges and details of a digital image without amplifying noise in the digital image provide an output image which is the sum of the input image and its adaptively-amplified high frequency components, which adaptively amplified high frequency components are obtained by subtracting a low-pass filtered image from the input image. An adaptive amplification factor for the high frequency components is determined as a function of a variance of the pixel values surrounding a pixel and the noise power of the imaging system (Song, Abstract).

By contrast, **Claim 1** is directed to a method for enhancing an image, which comprises: obtaining a first image signal including pixel values; obtaining a high-pass image signal having high-frequency components of the first image signal; obtaining a positive non-zero weighting factor to control a degree of enhancement; selecting edge pixel values representing a boundary of an edge in the first image; for suppressing shoots, defining a gain suppressing function having attenuation coefficients to be multiplied with particular pixel values of the high-pass image signal corresponding in location to the edge pixel values; multiplying the high-pass image signal by the weighting factor and by the gain suppressing function to obtain a result; and adding the result to the first image signal to obtain an enhanced image signal in which the shoots have been suppressed.

Further, Song col. 9, lines 13-18 (relied on by the Examiner), does not disclose "selecting edge pixel values representing a *boundary* of an edge in the first image," as required by Claim 1 (emphasis added). In col. 9, lines 13-18, Song simply mentions that the high frequency component of the pixel value to be enhanced is determined as x(i,j) - z(i,j), wherein x(i,j) denote the pixel value to be enhanced at point (i,j) of the two-dimensional array of pixel values, and z(i,j) denote a "blurred image" for the select group of pixel values surrounding the pixel value to be enhanced.

The Examiner simply states that such high frequency components represent the edges of an image and the values obtained are in a two-dimensional array of pixels. However, there is no disclosure in Song that x(i,j) - z(i,j) is the same as selecting edge pixel values representing a boundary of an edge in the first image, as claimed herein. Nor has the Examiner explained the Examiner's reasoning behind equating determining high frequency components in Song and selecting edge pixel values representing a boundary of an edge in the first image, as claimed herein.

Indeed, in col. 2, lines 6-10, Song simply mentions enhancing the edges and details of an image without disclosing the step of specifically selecting pixel values that represent boundary of an edge, as claimed. It is respectfully submitted that general image enhancement in Song does not disclose the step of selecting pixel values that define boundary of an edge for further processing according to the present invention. According to the present invention, shoots are

likely to occur at edge boundaries, and as such are specifically selected for shoot suppression.

Further, Song does not disclose "defining a gain suppressing function having attenuation coefficients to be multiplied with particular pixel values of the high-pass image signal corresponding in location to the edge pixel values," as required by Claim 1. In col. 9, lines 19-20 (relied on by the Examiner) Song only mentions: "Next, an adaptive amplification factor s which varies from 0 to 1 is determined using the generalized statistical variance of pixel values around the pixel value to be enhanced, v(i,j), and an estimate of the image noise power of the system (block 260, FIG. 2)."

Despite the Examiner's interpretation, Song's adaptive amplification factor s is not the same as a gain suppressing function *corresponding to the edge pixel values*, as claimed. The Examiner has not explained how Song's adaptive amplification factor s discloses a gain suppressing function *corresponding to the edge pixel values*, as claimed. The gain suppressing function claimed herein is based on probability of shoot at edges. No such limitations are taught or suggested by Song.

The gain suppression function herein is defined based on the selected pixel values that define an edge. Such a gain suppression function has attenuation coefficients that are to be multiplied with particular pixel values corresponding in location to the edge pixel values. Such limitations are not disclosed by, and do not apply to, Song's general image enhancement method,

and which is not specifically sensitive to edges as that claimed invention herein. For at least these reasons, rejection of Claim 1 and all rejected claims dependent therefrom should be withdrawn.

Regarding **Claims 6 and 7**, as discussed in relation to Claim 1, Song does not disclose selecting pixels that define an edge in the image. As such, for at least the reasons provided in relation to Claim 1, Song does not disclose selecting pixels that define an edge in the horizontal or vertical direction, as claimed.

Figs. 3E-H in Song simply show a group of pixels ("filter support") surrounding the pixel value to be enhanced (col. 2, lines 40-43; col. 7, line 62-66). The pixels in Figs. 3E-H are in vertical and horizontal direction since they define an area surrounding a pixel to be enhanced. There is no disclosure in Song that the "filter support" pixels in Figs. 3E-H are selected pixels that represent edges in the image in the vertical or horizontal direction that are specifically selected for shoot suppression according to the claimed invention.

Claim rejections under 35 U.S.C. 103(a)

Rejection of Claim 9 under 35 USC 103(a) as being unpatentable over Song is respectfully traversed because Song does not teach or suggest all of the claimed limitations. As discussed above, Song does not disclose all of the limitations of Claim 1. Further, as the

Examiner states Song does not disclose that "the gain suppressing function inherently performs the step of selecting the edge pixel values," as required by Claim 9. The Examiner states that the expression s[x(i,j)-z(i,j)] in Song renders the claimed limitations obvious though the Examiner admits that s[x(i,j)-z(i,j)] in Song represents two separate operations (i.e., x(i,j)-z(i,j) and then s[]).

First, as discussed, x(i,j)-z(i,j) in Song does not disclose selecting edge pixel values representing a boundary of an edge.

Second, as discussed, s[] in Song is not the same as a gain suppressing function having attenuation coefficients that are to be multiplied with particular pixel values corresponding in location to the edge pixel values. Such limitations are not disclosed by, and do not apply to, Song's general image enhancement method, and which is not specifically sensitive to edges as that claimed invention herein. The gain suppression function herein is defined based on the selected pixel values that define an edge, which is not disclosed by Song.

Third, s[x(i,j)-z(i,j)] in Song is two sequential operations as the Examiner admits, and cannot be combined into one because in Song first the high frequency components are determined as x(i,j)-z(i,j), and then the functions s[] is applied to those high frequency components. The Examiner states that combining these two operations would be obvious and simplify matters, but the Examiner has forgotten to specify how such operations can be done at

the same time. Applicants would much like to see how the Examiner would overcome laws of mathematics and sequence of steps by calculating x(i,j)-z(i,j) and s[] at the same time such that s[] in Song inherently performs the step of selecting the edge pixel values, as claimed herein.

Further, the Examiner assumes that the claimed limitation is simply a combination of functions, and therefore obvious. This assumption is respectfully traversed. Applicants respectfully request the Examiner to explain why the Examiner is assuming that claimed limitation (i.e., the gain suppressing function inherently performs the step of selecting the edge pixel values) is simply a combination of functions. If Claim 9 is once again rejected Applicants respectfully request that the Examiner provide support for the assumption. The cited references, alone or in combination do not disclose the claimed limitations. No *prima facie* case of obviousness has been established.

New Claims

New Claim 13 includes all of the limitations of Claim 1, and further adds the limitations that the gain suppressing function is based on the probability of shoot at the edge pixel values. As discussed, the references do not disclose all of the limitations of Claim 1, and as a result the references do not disclose all of the limitations of Claim 13. Further, the references, alone or in combination, do not disclose that the gain suppressing function is based on the probability of shoot at the edge pixel values, as required by Claim 13.

Similarly, new Claim 14 includes all of the limitations of Claim 1, and further adds the limitation that the gain suppressing function is based on the probability of shoot at the edge pixel values such that the gain suppression function increases as probability of shoot increases to reduce shoot. Such limitations are not disclosed by the references alone or in combination.

CONCLUSION

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For these, and other, reasons, Applicants believe that the claims are in condition for allowance. Reconsideration, re-examination, and allowance of all claims are respectfully requested.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: MS AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on

August 17, 2005.

By: Sarah A. Nielsen

Sarah A. Nielsen

Signature

August 17, 2005

Respectfully submitted,

8/17/05

Kenneth L. Sherman (Date)
Registration No. 33,783
Myers Dawes Andras & Sherman, LLP
19900 MacArthur Blvd., 11th Floor
Irvine, CA 92612
(949) 223-9600
(949) 223-9610 – Fax
Customer No.: 23386

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